NPV, IRR or the Payback period. What's the preferred method in corporations in analyzing investments?

The answer is two-fold: For one, most often not only one of the three is considered, but two or all three of them, because the information they give differs (more on this below). The second part of the answer would be that it can depend quite a bit on the preferences of the final deciding person/body. At my company NPV and pay back used to be by far the most important parameters. Recently, IRR has become the most important measure because of a shift in preferences, experience, understanding in the ultimate decision body.

This is not right or wrong, as explained below, it is just different as long as you understand the numbers and what assumption they encompass.

Pay back: Does not take into account when the money is paid or earned. It deals with the risk of the business in a very different way than NPV or IRR. Still, many companies have a pay back hurdle. They will not do an investment, if it takes longer than x years. That bar may be arbitrary, but it is one way to deal with uncertainty.

NPV: Tells you the value that you create through the project, IF you execute it exactly as projected. Advantages: You understand easily how much value the project adds and you can compare it with others as it is an absolute value. Disadvantage: 1) It is an absolute value. The larger project always creates a higher amount, but is not necessarily better. 2) NPV is calculated by discounting with the WACC. The WACC is calculated with the Beta, which reflects the businesses' risk. It does not reflect the execution risk. If the underlying business case is calculated very aggressively and the likelihood of meeting that business plan is low, that is not reflected in the DCF. 3) NPV by itself does not show you what the impact is if the cash flow is x% lower or project takes longer. For that, you need a sensitivity analysis.

IRR: Advantage: Shows you the return in % and therefore you can compare between projects of different sizes. But taking on too many small projects with good IRR might be too much work. If all internal efforts are included, then that issue should be eliminated. Disadvantage: More difficult to understand what an increase implies. Increase from 12% to 15% might double the NPV (depending on the timing of the cash flows)!